

term which I employ is his, though the fact was not known to him.

I have published an article describing these experiments, which may be known to you, but I have since found some new facts. At Berlin I tested some metals which I had not tried before. I cannot vouch for the quantities within 50 per cent., but I think I can vouch for the direction of the effect. It is not the same for different metals under the same conditions of current and magnetic force. It might have been expected that the effect would be in the same direction in nickel as in iron; but it is not, it is in the opposite direction; nickel acts like gold, cobalt acts like iron. Nickel, silver, gold, platinum, and tin gave an effect opposite to iron.

The most important fact that I have to bring before you is that in zinc the effect is in the same direction as in iron and cobalt.

Table of effects on an arbitrary scale.

Iron	+ 78	Brass	- 1'3
Cobalt	+ 25	Platinum	- 2'4
Zinc	+ 15	Gold	- 6'8
Lead	—	Silver	- 8'6
Tin	+ 0'2	Copper	- 10
		Aluminium	- 50
		Magnesium	- 50
		Nickel	- 120

The deflection of the current in those marked + is in the same direction in which the conductor itself tends to move in the magnetic field. I cannot vouch for the order of the metals. I have tried three specimens of nickel, and the direction was the same in them all. One of them was pure nickel, furnished me by Prof. Chandler Roberts.

The following remarks were made by the chairman, Sir William Thomson:—

The subject of this communication is by far the greatest discovery that has been made in respect to the electric properties of metals since the times of Faraday—a discovery comparable with the greatest made by Faraday. I look upon it with special interest myself as so closely connected with electrodynamic properties of metals, which formed the subject of my Bakerian Lecture in 1856. I pointed out in that paper, in about § 104, that it was to be expected that magnetic induction would produce change of thermal conductivity and of electric conductivity in different directions in substances perfectly isotropic. I found by mathematical investigation rotational terms, and pointed out that we might expect in bodies which have rotational quality to find the effect of such terms exhibited. But the only influence having that relation to rotation which was necessary for producing the terms in question I pointed out to be the influence of a magnet, and that we might expect that the effect of a magnet upon an isotropic body would be to induce difference of quality in different directions in accordance with the rotatory term, and I said I thought it improbable that the rotatory terms would be found to be null in a body subjected to the influence of a magnet. I look with great delight on Prof. Hall's discovery, as having verified that which I predicted as probable. I did not myself make any serious attempt to discover it. It is the first illustration ever brought out by experiment of one of the most curious and interesting things in the mathematics of æolotropy. The previous mathematical writers dismissed these terms altogether, although they found them in the formula;—dismissed them as something which we could not imagine to exist. I refused to dismiss them, and said there was decided reason that they could exist under the rotational influence which we know to belong to a magnet.

Prof. Rowland said: Mr. Hall had tried the direction of rotation of the plane of polarisation when light is reflected from nickel and iron on Dr. Kerr's plan. The direction was found, if he remembered aright, to be in opposite directions for these two metals. We did not yet know enough to say whether this investigation explains the rotation of the plane of polarisation of light.

Prof. Sylvanus Thompson said he had verified Prof. Hall's result by using a telephone instead of a galvanometer.

Mr. Glazebrook said he had published a paper on the same subject in connection with the rotation of the plane of polarisation of light. Maxwell said this effect (rotation of the plane of polarisation by reflection from a magnet) could be explained by molecular rotation of the particles in the field.

Prof. Fitzgerald asked Sir William Thomson to express an opinion as to how it happens that different substances differ in

the direction of this effect. He also remarked that the terms expressing the magnetic force on the matter were the same as those which would express Prof. Hall's observed effect on the current. Was the action to be regarded as an action on the matter or on the current?

Prof. Everett asked whether the current in its deflected condition was oblique (instead of, as usual, normal) to the equipotential surfaces?

Sir William Thomson, in reply, said that effect on matter and effect on the current through it went together, and could not be distinguished. He could not say why the effect in any particular metal was in one direction rather than the other. There was nothing in the mathematical theory to show in which metals it should be in the same direction. Prof. Everett's question might be answered by referring to several corresponding cases. If heat was flowing from end to end of a bar cut obliquely from a crystal, the points of equal temperature in two opposite sides would not in general be exactly opposite to each other. The foundation of the general theory of which this was an illustration had been laid by Prof. Stokes.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—On November 3 Sir William Anson, Bart., D.C.L., Fellow and Sub-Warden, was elected Warden of All Souls' College in succession to Dr. Leighton, deceased. Sir William Anson was Vinerian Reader in English Law.

A Fellowship at University College will be offered for competition about the end of next February. The examination will be in biology and kindred subjects. At the last examination for a Biological Fellowship none of the candidates were judged of sufficient merit, and the election was accordingly deferred.

Candidates for the Brackenbury Natural Science Scholarship at Balliol College must communicate with the Master by letter on or before Friday, November 11. Papers will be set in Chemistry, Mechanics and Physics, and in Biology. There will also be an optional paper in Mathematics, and an essay.

At Christ Church there will be one or more Natural Science Junior Studentships elected next March. Candidates must not have exceeded the age of twenty on January 1, 1882. Papers will be set in Chemistry, Biology, and Physics, but no candidate will be allowed to offer himself in more than two of these subjects.

CAMBRIDGE.—On Monday, November 7, Mr. J. E. Marr, F.G.S., was elected to a Fellowship at St. John's College. In 1878 Mr. Marr obtained a First Class in the Natural Sciences Tripos; in 1879 he received a grant from the University to enable him to travel in Bohemia and study the Cambrian and Silurian rocks there; also in 1880 he went in a similar manner to Norway and Sweden. His paper on the Rocks of Bohemia was published in the *Quarterly Journal* of the Geological Society for November 1880. He is at present lecturing for the University at Parrow Kendal, and Lancaster.

GLASGOW.—Mr. John Macalister Dodds, B.A., Fellow of St. Peter's College, Cambridge, 4th Wrangler, 1880, has been appointed one of the assistants to Dr. Jack, Professor of Mathematics in the University of Glasgow. Mr. Dodds was a distinguished Glasgow student before proceeding to Cambridge. All the four Professors of Mathematics and Natural Philosophy in the Universities of Edinburgh and Glasgow—Prof. Tait, Prof. Chrystal, Prof. Sir William Thomson, and Prof. Jack—are Peterhouse men.

SCIENTIFIC SERIALS

The American Naturalist for September and October, 1881, contains (No. 9, vol. xv.): Carl F. Gessler, variations in a copepod crustacean (woodcuts).—A. S. Packard, jun., *Scolopendrella* and its position in nature (places *Symphyla* as a sub-order of *Thysanura*).—W. H. Dall, American work in the department of recent mollusca in 1880.—D. G. Brinton, notes on the Codex Troano and Maya chronology.

No. 10, vol. xv.: D. H. Campbell, on the development of the stomata of *Tradescantia* and Indian corn (woodcuts).—Cyrus Thomas, the age of the manuscript Troano.—J. Walter Fewkes, the *Physophoridae* (iii.).—R. E. Cull, the Loess in Central Iowa.—A. S. Packard, jun., on the early stages of the

fiddler crab and of *Alpheus*.—Hartley Barnes, Reason: a psychological distinction.

Bulletin de l'Académie Royale des Sciences de Belgique, No. 8.—Palæontological documents relating to the Cambrian formation of Ardenne, by M. Malaise.—Magic square of the Villa Albani (Rome), by M. Catalan.—On the specific weight of sulphur of Ch. Saint-Claire Deville, by M. Spring.—On the dilatation of sulphur, selenium, and tellurium, by the same.—On the rotatory power of albumen of a dog's blood, by M. Fredericq.—Latitude on a voyage; graphic process, by M. Acan.—On the monazite of the quarries of Nil, St. Vincent, by M. Renard.—Description of a new and precise registering barometer, by M. Delaey.

Journal de Physique, October.—Determination of the wavelengths of the very refrangible radiations of magnesium, cadmium, zinc, and aluminium, by M. Cornu.—Researches on the refringent power of liquids (continued), by M. Damien.—Experimental researches on the capacity of voltaic polarisation (concluded), by M. Blondlot.—Measurement of the energy expended by an electric apparatus, by M. Potier.—Experiment in optics, by M. Dubois.

La Natura, October.—On the thermal radiation and the temperature of the sun, by S. Cattaneo.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti, vol. xiv. fasc. xv.—Discussion of some mistakes regarding American vines, by Count Trevisan.—Alteration of muscular fibres in a case of locomotor ataxy, by Prof. Golgi.—On photoparæsthesia in insane persons, by Dr. Raggi.—On variations in the velocity of the arterial current following paralysis of the vagus nerve, by Prof. Solera.—Anomaly in a parrot (*Psittacus Amazonicus*, Lin.), by Prof. Maggi.—Elimination of nitrogen from tyrosine, by Prof. Körner and Dr. Menozzi.—On some products of transformation of chinoline, by Prof. Körner.

Rivista Scientifico-Industriale, September 30.—The axis of rotation of Mercury, by T. Zona.—A compressed air bell-rheometer, by S. Scardona.

Rendiconti delle Sessioni dell'Accademia delle Scienze dell'Istituto di Bologna, 1880-81.—We note here the following:—On the internal discharges of condensers, by E. Villari.—Adaptation of species to their environment; new observations on the genetic history of Trematodes, by G. Ercolani.—On the mode of termination of nerve-fibres in the cornea, and the internal construction of the axis-cylinder, by G. V. Ciaccio.—Anthropometric researches on the Bolognese, by G. Peli.—Chemico-toxicological researches on a putrefied brain, by C. Stroppa and G. Tomani.—Morphological, anatomical, and organic researches on the various species of the genus *Citrus*, by G. Cugini.—On the course of the river Po, and on works which must be undertaken in presence of danger which threatens the neighbouring population, by P. Predieri.—New method of obtaining pure gastric juice and determining its physiological properties, by L. Vella.—Electric shadows, by A. Righi.—On defective births in the females of *Myoxus glis*, and in the human species, by G. B. Ercolani.—On the ovulation of *Distoma hepaticum* and *lanceolatum* in sheep and oxen, by G. B. Ercolani.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, November 3.—Dr. Gilbert in the chair.—The following papers were read:—On citraconic and mesaconic ethers and malic and fumaric acids, by W. H. Perkin. The author has carefully investigated the physical properties of the methylic and ethylic ethers of citra- and mesaconic acids. Dr. Gladstone has also measured their refractive indices. The citraconic ethers boil at a higher temperature than the mesaconic ethers, but their specific gravities, magnetic rotatory power, and refractive indices are lower. Only one anhydride can be obtained from maleic and fumaric acids, one from citra- and mesaconic acids, and one from α and β coumaric acids. Maleic anhydride can be obtained directly from malic acid by heating with an excess of acetylic chloride.—On the action of potassium cyanide on bismuthous nitrate, by M. M. P. Muir. A puce-coloured body is formed, $\text{Bi}_2(\text{CN})_6\text{O}_{15}$; by heating with strong potash Bi_2O_3 is obtained.—On the atomic weight of bismuth, by M. M. P. Muir. The author has analysed bismuthous chloride, and obtained as a mean atmospheric weight

210.46, but he is not satisfied with the results, and hopes to obtain better numbers by the synthesis of bismuthous iodide.—Additional observations on the halogen salts of bismuth, by M. M. P. Muir.—Note on the action of sulphuric acid on zinc and tin, by M. M. P. Muir and C. E. Robbs.—On the volumetric estimation of bismuth in the form of oxalate, by M. M. P. Muir and C. E. Robbs.—Note on the influence of water on the reaction between potassium iodide and chlorine, by M. M. P. Muir and R. Threlfall.—Laboratory notes, by M. M. P. Muir. 1. Lecture experiment showing the effect of "a" time, "b" temperature, "c" mass. This consists in adding a solution of bismuth iodide in hydriodic acid to each of three beakers, one containing 100 cc. of cold water, 100 cc. of hot water, and 500 cc. of cold water. 2. The solution of manganese dioxide and manganese ores in hydrochloric acid is much hastened by potassium iodide. 3. A new method of detecting tin in the presence of antimony: by boiling with metallic copper and testing for stannous salt with mercuric chloride. 4. To detect the haloid acids in presence of nitrons and nitric acids.—On suberone, by R. S. Dale and C. Schorlemmer.—On sulphonic acids derived from isodinaphthyl, by Watson Smith and T. Takamatsu.—On phenyl apthalene, by Watson Smith and T. Takamatsu.—On dimethylmalonic acid and dimethylbarbituric acid, by L. T. Thorne. The author confirms the conclusions arrived at by Conrad and Guthzeit.

PARIS

Academy of Sciences, October 31.—M. Wurtz in the chair.—On account of the death of M. Bouillaud the séance was adjourned.—*Comptes rendus* for the week contains—Observations of Cruls' comet (δ 1881) at Marseilles Observatory, by M. Stephan.—Elliptic elements of the same comet, by M. Bossert.—Observations of comets c 1881 (Schäberle), d 1881 (Encke), e 1881 (Barnard), f 1881 (Denning), at Paris Observatory, by M. Bigourdan.

VIENNA

Imperial Academy of Sciences, October 20.—V. Burg in the chair.—L. E. Tiefenbacher, on the forest and its relations to landslips (a supplement to a work by the same author, on landslips, their causes, effects, and treatment).—F. Auertlitz, a contribution to the ballistic problem.—E. Mahler, theory of curvature of an n -fold manifoldness.—E. Weiss, computation of the elements and ephemeris of Barnard's comet (continued).

GÖTTINGEN

Royal Society of Sciences, June 4.—Absolute measurement of the strength of terrestrial magnetism by a galvanic method without determination of time, by F. Kohlrausch.—Theory of curves of double curvature, by A. Enneper.—Remarks on some transformations of surfaces, by the same.

August 6.—Lycopodin, by K. Bædeker.

CONTENTS

	PAGE
BALFOUR'S "COMPARATIVE EMBRYOLOGY." By Prof. E. RAY LANKESTER, F.R.S.	25
PRIMITIVE INDUSTRY	27
SACRED MYTHS OF POLYNESIA. By EDWARD B. TYLOR, F.R.S. . . .	28
LETTERS TO THE EDITOR:—	
The Struggle of Paris in the Organism.—Geo. J. ROMANES, F.R.S.	29
Prof. Stokes' Lectures on Solar Physics.—G. G. STOKES, Sec. R.S.	30
The Society of Arts Patent Bill.—LEX	30
"The Lepidoptera of Ceylon."—HENRY TRIMEN	32
An Alleged Diminution in the Size of Men's Heads.—HYDE CLARKE	32
Sound-producing Ants.—H. F. BLANFORD	32
Song of the Lizard.—FRANCIS P. PASCOE	32
SEA FOGH. By Dr. J. H. GLADSTONE, F.R.S.	33
OUR WINTER REFUGES.—VENTNOR	33
INTERNATIONAL GEOLOGICAL CONGRESS	34
THE AUTUMN SKY, II. By Rev. T. W. WEBB (With Diagrams) . .	36
AN OBSERVATORY FOR HONGKONG	39
PROBING BY ELECTRICITY. By Prof. GRAHAM BELL (With Diagrams)	40
MAGNETIC SURVEY OF MISSOURI. By FRANCIS E. NIPHER	40
THE ECHINOIDS OF THE "CHALLENGER." By Prof. H. W. MACKINTOSH	41
NOTES	42
OUR ASTRONOMICAL COLUMN:—	
Double Stars	43
GEOGRAPHICAL NOTES	43
SCIENCE IN NEW SOUTH WALES	44
ON THE APPLICATION OF PHOTOMETRY IN THE STUDY OF THE PHENOMENA OF DIFFUSION IN LIQUIDS. By Dr. S. WROBLEWSKI	45
THE ROTATIONAL CO-EFFICIENT IN VARIOUS METALS	46
UNIVERSITY AND EDUCATIONAL INTELLIGENCE	47
SCIENTIFIC SERIALS	47
SOCIETIES AND ACADEMIES	48